Estimating Prices for Future Purchases

Appendix I

Introduction

The purpose of this appendix is to provide guidelines for pricing purchases of goods and services. These guidelines are intended to be useful to those involved both in preparation and review of Department of the Navy budget exhibits. The establishment of appropriate prices for budget purposes is a two step process. The first step requires the determination of a base price. The second step is to adjust the base price for the impact of the projected rates of inflation between the year of the base price and the actual planned year of procurement. This second step is the application of approved price escalation indices to the base price.

A base price may be developed in a number of ways. The base price can be the latest actual price charged to the government adjusted for known changes. In the absence of actual experience, the base price may be developed from an independent government cost analysis, contractor provided estimates, experience on similar procurements, or a combination of these data sources. The uninflated, or base, price of a future purchase should include those price effects which result from changes in the business environment, the physical characteristics of the product, and the production process. The base price should not reflect increases in the cost of producing the same item under the same circumstances. Such increases are properly accounted for by applying the appropriate price escalation index to the developed base price.

Chapter 1 of this Appendix provides guidelines for developing estimates of base prices. Chapter 2 provides guidance for incorporating the effects of inflation into pricing estimates.

Table of Contents

Appendix I

Chapter 1 Estimating the Base Price

Chapter 2 Adjusting Price Estimates for Inflation

Chapter 1

Estimating the Base Price

1. Overview. Determining the initial base price for a future purchase can be relatively simple if the same item has been purchased recently and if the factors influencing the cost of that purchase will still apply at the planned time of procurement. On the other hand, developing a base price utilizing an independent government cost analysis, contractor provided estimates, or experience in similar is more difficult. Care must be taken to develop a realistic and reasonable estimate of the procurement base price.

   a. Complexity. Making useful cost predictions of future weapons systems varies in complexity and difficulty, depending upon the degree of definition and specification of the system. Regardless of the circumstances, every effort must be made to reduce the uncertainty and improve the quality of the estimates used to budget for these systems. All factors that impact cost must be considered. Careful attention should be given to physical changes in the product or production process which involve anticipated improvements in the production process, minor modifications in the product itself and the plans for integrating a new product into an existing system. While these factors are not likely to be mistaken for inflation, they are nevertheless frequently neglected in the determination of the base price of a future purchase.

   b. Reducing Uncertainty. Although uncertainties exist, the effects of the above factors should not be dismissed. Taken together, they represent an important reason for cost overruns, unanticipated shortfalls and the overall inability to consistently meet long-term goals. Considering carefully all the factors influencing future purchase prices is simply good budgeting. Once these influences have been assessed, the most advantageous procurement and contractual strategy can be developed and pursued. In short, these factors should be considered as early as possible in program development and updated as required. They should, above all, be regarded as non-inflationary influences and be reflected in the price of a future purchase prior to any adjustment for inflation.

   c. Steps in Estimating the Base Price.

      (1) The development of an appropriate price for use in the budget process for the procurement of an item, service, weapon system, aircraft or ship is a complex process. The following tasks should be considered when estimating the base price:

      - Describe the system/item
      - Identify factors which influence the cost of future purchases
      - Determine cost/quantity relationships
      - Coordinate estimating and accounting structures
      - Obtain and evaluate base price data
      - Select estimating methods
      - Determine the appropriation(s) affected by the purchase

      (2) The extent to which each task will be pursued will depend on the dollars involved. This is an area of judgment similar to development of a personal budget. For example, one might check the price of a

television set at two or three stores but the price of an automobile might require a review of consumer literature and checking several dealers. These steps are normally performed sequentially; however, in the case of complex systems they may be performed concurrently and .

2. System/Item Description. An adequate system description is a prerequisite to preparing valid budget estimates. It provides the basis and concept upon which the system is costed. Any lack of definition should be resolved with the program manager or the technical engineers as appropriate.

   a. Changes. The cost of planned or likely modifications of the product, however minor, must be thoroughly analyzed. Of particular importance is the point in the development or production process at which modifications of the product are likely to be made. The impact of changes must be included in the base price in the fiscal year in which the changes will impact the budget.

   b. Government Owned Material. Frequently, a new system will make use of government owned materials or components from the system that is being replaced. These items may be supplied to the manufacturer or incorporated when the new equipment is installed. But in either case, incorporating government owned material into new systems is likely to vary from case to case and from year to year. Such changes must be considered in developing the base price of future purchases.

   c. Background Information. Relevant background information may include potential contractors, information on past estimates for the system, and estimates for similar systems.

3. Factors which Influence the Cost of Future Purchases. There may be conditions which affect the ultimate cost of an item or system. Identification of these constraints is necessary in order to provide a valid estimate of the cost of an item or system. The uninflated, or base price of a future purchase should include all changes in the business environment which could affect the price, the physical characteristics of the product, and the production process.

   a. Projected Business Base.

      (1) Changes in the business environment generally involve factors such as the procurement profile (quantity or delivery schedule), the expected availability of production inputs, the number of firms involved in the contract, the capacity of those firms and the rate of production. It is often assumed that such factors are somehow accounted for by the proper use of escalation indices, but this is not the case. All factors of the business environment may vary over time and consequently must be re-examined and reflected in the base price prior to any adjustment for inflation.

      (2) The acquisition environment and the business base frequently change, and in the absence of a multi-year contract, such changes will influence the price of future purchases. The number of firms capable of and willing to supply a product may, for example, vary. An increase in competition will generally drive the cost of an item down. On the other hand, alternate production sources may drop out of the business, eliminating the competitive pressure and drive prices up. The existence of competition is especially important for controlling cost whenever fixed price contracts are used for procurement. Consequently, both competition and the proposed type of contract should be taken into consideration when the base price is developed.

      (3) Depending upon the procurement profile, the optimum level of production, the existing capacity of each firm and the forecasts of long term demand, the product may or may not be produced efficiently. Consequently, the base price for budgeting must be adjusted to reflect these impacts. Depending on the type of contract and the amount of non-defense related business a company does, the impact of

various business base factors must be considered. In cost-type contracts the impact of underutilized equipment and facilities, the overhead costs over the total business, and production rates can be significant.

b. Material Prices. Another important factor that affects the production process and the price of goods in the outyears is the availability of material. The failure to take into consideration this type of price impact is a common cause of cost overruns. It may, in certain circumstances, be difficult to separate a price increase caused by inflation from a price increase driven by a material shortage. Acute temporary shortages of specific materials which are of a limited nature (e.g., Titanium) should be considered in the base price; however, shortages that develop as part of a long-term trend which affects the economy as a whole (e.g., oil prices) are accounted for in general or specific escalation indices. In short, some attention must be given to likely changes in the microeconomic environment that will influence the price of a future purchase.

c. Schedule Impacts. Major program milestones, manufacturing plans, production plans, procurement plans, and both technical and administrative lead time affect the procurement schedule on which a budget estimate is based. While program phasing should be optimized within available funding, the budget must reflect a realistic procurement profile.

d. The Production Process. In determining a base price, the impact of investment or non-investment in production facilities must be judged and incorporated as appropriate. Inefficiencies may occur if firms do not invest in the production process because of uncertainty regarding future demand. More frequently, however, a firm will find itself with excess capacity because the procurement profile was reduced and no longer requires the utilization of high rate production equipment.

e. Summary. These are only some of the more significant factors which influence the price of future purchases. There are undoubtedly others. It will often be difficult to distinguish between inflation-related and non-inflation related influences. Additionally, it may be difficult to translate non-inflation changes into the base price of goods or services. The estimated change in the base price may, for example, be smaller than the uncertainty involved in the estimate of inflation. However, the accuracy with which such estimates can be made will ultimately improve the quality of budget estimates.

4. Cost/Quantity Relationships. Data and experience indicate that the cost of producing an item declines as additional units are produced. The cost improvement or learning curve concept expresses the relationship of the cumulative quantity of an item produced to the cost of producing it. As usually expressed, a learning curve portrays either the reduction in cost associated with each doubling of cumulative quantities produced or the decline in the cost of the item by some constant percentage factor when additional units are produced. The concept of cost improvement is applied in adjusting historical data and in developing the cost estimate.

a. Factors in Learning.

Many factors contribute to cost improvement or learning:

- The spread of certain fixed overhead costs over a larger production run.
- A reduction in engineering change costs and rework requirements as design stabilizes.
- An increase in labor efficiency and experience in the production processes.
- The efficiencies gained through the purchase of materials in larger quantities.

- The efficiencies associated with management-supplier improvements in tools and tool coordination, shop organization, engineering liaison, and subassembly parts supply systems.

b. Justification of Learning. A very important consideration in preparing or reviewing a specific production budget is that the budgeted learning curve must reflect a realistic level of learning. For example if the learning curve for the AN/SPA X repeater is projected to be 86% when similar repeater procurement programs in the past have experienced a learning curve of 92%, the analyst must determine if valid reasons exist for the greatly improved rate. A change in production methodology such as use of robotics might account for the difference. It is important to be able to justify the learning curve being used. Use of an incorrect learning curve will result in budgeting too much or not enough funds.

c. References. Numerous texts and manuals are available on application of improvement/learning curves, and applying confidence intervals to other aspects of cost estimating. One good reference is H. Asher, Cost-Quantity Relationships in the Airframe Industry R-291, RAND Corporation, Santa Monica, California.

5. Estimating and Accounting Structures. The budget, the cost estimates, and the accounting system that collects actual cost data should use the same structure. This requirement is frequently overlooked when new programs are approved and the result is the inability to compare actual costs and revised estimates to the budget. Execution problems cannot be predicted easily and corrected in advance.

a. Work Breakdown Structure (WBS). The work breakdown structure (WBS) constitutes the framework for the estimate and subsequently for the contractor's and cost collection and reporting on . Using the WBS provides a systematic approach to cost estimating and budgeting that ensures relevant costs are not omitted. Military Standard 881 provides WBS tailored to various types of procurements. Each level in the WBS consists of groups of similar items each of which is a more detailed breakdown of the preceding.

b. Level of Detail. The level of detail and depth to which an estimate is prepared is often based on the availability of data, methodology employed, and time available.

6. Base Price Data. In collecting data, the quantity, comparability, quality, and relevancy must be considered. Experience, judgment, and ingenuity must be applied when using the data to develop a valid estimate of the base price of an item. In estimating the future price of a , actual cost data are generally available. In estimating a new item or system cost, the analyst must rely heavily on actual costs of analogous programs. No new program, however novel, represents a complete departure from everything that has gone before. In fact, many new programs embody relatively modest improvements over previous programs, or are combinations of existing subsystems, equipment and components. The establishment of appropriate prices for budgetary purposes requires a thorough search for relevant data, evaluation of that data, and development of estimates based on good judgment and research.

a. Sources of Data.

(1) The sources of data may be divided into two broad categories. The first type is a record of costs for a particular program or system. Actual records, reports, and studies may be included. The second type of data provides standard cost data that applies across-the-board to many programs or systems.

(2) The first category of data sources include actual cost records, contractor provided estimates, study proposals, or industry media or electronic bulletin boards.

(a) There are several potential sources of active cost records. Contract Funds Status Reports () and Cost Performance Reports (CPR) provide actual historical cost data on in-production and analogous systems. Naval Audit Service Reports and similar reports from the other services provide cost data on some systems. Defense Contract Audit Agency () reports and records provide data on all items and systems in production. Finally, DOD plant representative offices, such as a NAVPRO, may have reports and records that also provide actual cost data.

(b) Under the Defense Acquisition Regulations major systems contractors are asked to demonstrate the validity of bids on defense . This data, after careful evaluation by government experts, provides cost information that can be used to determine future prices for budgetary purposes. Contractors also may be willing to provide price quotes for use in estimating future prices. Care should be taken in evaluating the validity of these estimates.

(c) Study proposals which report on the feasibility, system analysis, and cost-effectiveness of particular systems, can be useful in estimating the costs of analogous systems. These reports are prepared by the Military Departments, nonprofit technical support organizations, and industry. The National Technical Information Service and various military libraries as well as the information super highway can provide assistance to the analyst in locating relevant studies.

(3) The category of standard cost data includes statistical summary documents, catalogs, and estimating relationship studies.

(a) Statistical summary documents give the average historical cost experience of numerous systems or programs for a given type of cost. An example of this type of document is the Cost and Planning Factors Manual, Defense Information Systems Agency (DISA), Circular 600-60-1, March, 1983, Changes 1-6.

(b) Catalogs are especially useful for pricing standard items such as copying machines or trucks. In addition to individual manufacturer catalogs, various government procurement offices issue catalogs, such as the General Service Administration (GSA).

(c) Estimating relationship studies, where carefully documented, provide estimating equations for converting descriptive program data into cost estimates. For example, “dollars per pound” estimates for missiles or “support equipment cost as a percentage of fly away cost” for aircraft. Methods of Estimating Fixed Wing Aircraft Costs, PRC-R-547, by Planning Research Corporation is one such study.

b. Collecting Data.

(1) Use should be made of the Defense Technical Information Center (DTIC) and other facilities when historical data on analogous programs is the primary source of price estimates. Historical sources may also be used to identify individuals who are authorities in various specialized areas. These individuals’ opinions can be an invaluable additional source of information. In collecting data, quantity, comparability, quality, and relevancy must be considered.

(2) One of the important factors affecting the degree of confidence and budgetary estimate is the quantity of relevant supporting data used to develop the estimate. Increasing the size of the data sample may improve the quality of the estimate where the proposed procurement is new and the estimator must rely heavily on analogous data. When only one or two analogous historical cost data points exist, standard statistical techniques may have limited application. When considering increasing the data

base, caution must be observed to ensure that the comparability, quality and relevance of the data in the estimating base are not degraded.

(3) Care must be taken to insure comparability of data drawn from different programs. In practice a given item of cost may include different items, materials or procedures. For instance, reported radar costs for one program may include radar parts costs only, while another program includes costs of radar and repeater parts and labor to install the system. Differences must be reconciled and costs adjusted before using the data.

(4) The quality of the data being used should be evaluated. In addition, time and technology can affect relevancy. For example, World War II aircraft were so significantly different in production method and material as to be misleading as a basis for modern aircraft cost estimating.

c. Guidelines for Data Evaluation.

(1) A relatively explicit approach to evaluation has two advantages: first, it helps check the logical and internal consistency of the methods used to evaluate the data collected, and second, it permits verification of the original analysis. The initial problem is to determine if one or more data sources are to be used. When more than one source is used, how much weight to give each source in arriving at the final estimate must be decided. The following guidelines are helpful.

(2) A single source is generally used when the item being estimated represents a moderate proportion of total system cost, the item is low priced, or when there is a single, firmly established, official, documented data source.

(3) More than one source is desirable when the item represents a sizable proportion of the total cost of a system, the item has a relatively large cost, or when no single, generally accepted estimating relationship is available. Also multiple sources should generally be used when the item involves a technological advance, new operating concepts or distinctive characteristics.

(4) The characteristics of the item constituting the analogous historical data base relative to those of the item being estimated should be evaluated. The greater the similarity, the greater the weight that should be given to the data source. A source that is unbiased, representative, supported, and verifiable should be given more weight than one that is less reliable. Generally more recent historical sources should be given more weight than earlier sources, all else being equal. Historical data sources should generally receive more weight than expert opinions when the technology and program characteristics of the item are similar to those of existing systems. However, expert opinions become more important if the technology is the current state of the art.

(5) An important criterion for evaluating opinions of experts is the extent to which they are backed up by supporting evidence, logical arguments, and facts. The qualifications of the experts, their consensus or disagreement, and the currency of the information should also be considered.

d. Uncertainty and Risk.

(1) Although risk and uncertainty are frequently used as equivalent terms, a useful distinction may be made between them. A risk situation is one in which the outcome is an uncontrollable, random event stemming from a known probability distribution. For example, the toss of a coin involves a risk with a 0.5 probability of “heads” turning up. An uncertain situation is characterized by the fact that the probability distribution of the uncontrollable, random event is unknown. This distinction sometimes

leads analysts to describe risks and uncertainties as “known-unknowns” and “unknown-unknowns,” respectively. Making useful cost predictions of future weapon systems varies in complexity and difficulty, depending upon the degree of definition and specification of the system and the availability of pertinent data. But regardless of the circumstances, estimates should identify the degree of uncertainty and anticipated risks.

(2) The sources of uncertainty and risks are many, and often difficult to identify and describe. Generally, the sources of uncertainty can be grouped under two major headings: system definition and estimating. Uncertainties in system definition may be minimized by clear explanation of the specific configuration, quantities planned, procurement and production schedules, and operational concept. Changes to some of these elements include the following.

(a) Engineering changes include altering the physical or functional characteristics of a system or item after an initial baseline is established. These change orders normally occur over the life of the program and tend to have a cumulative effect on the whole program; that is, they lead to spares and spare parts obsolescence, schedule delays, and, in general, increased program costs.

(b) A quantity change may impact the total cost of the buy, as well as unit and average cost, schedule, production efficiency, and contractual agreement. Consequently, the fiscal year distribution of dollars is affected.

(c) A change in support item requirements (spare parts, training, ancillary equipment, warranty provisions, Government-furnished property/equipment, testing) may result in changes to engineering design, quantity, or logistics concepts.

(d) A change in delivery schedule, completion date, or an intermediate milestone of development or production will usually impact the total program cost and the fiscal year distribution of dollars. When a schedule changes, the estimator must consider the impact of such items as overtime, production efficiency, and inflation.

(e) A policy change may impact significantly on the cost estimates.

(3) Estimating uncertainties are often more detailed and usually just as troublesome as system definition uncertainties. The major causes of estimate uncertainty are inability to measure cost precisely, inadequacy of usable data, statistical uncertainty, errors in the data, and errors of judgment. For example, constraints may force the analyst to employ estimating relationships that are based on data with a variety of errors—all interacting to an unknown degree. The analyst has two objectives in treating cost estimating uncertainties:

- Reduce the uncertainties surrounding the estimate.
- Assess both the reasons for, and the dollar impact of, the remaining uncertainty.

7. Estimating Methods. Development of a base price for a future purchase requires interpretation of observed historical phenomena which are adjusted to reflect the future contingencies. These interpretations may be made using several different methods including:

- Estimating relationships
- Specific analogies
- Specialist estimates
- Rates, factors, and catalog prices

- Industrial engineering standards
- Cost model applications
- Trend analysis

The selection of a particular estimating method will be guided by the availability of historical data, the level of detail required, the adequacy of descriptive parameters of the item being estimated, and time constraints. More than one method to derive a base price estimate may be used if time permits and accuracy necessitates. Using a second method to derive an estimate serves to validate the base price.

a. Estimating Relationships (ER's).

(1) There are many statistical tasks that can be used to form the basis for a price estimate. The techniques range in complexity from the simple average to various forms of regression analysis. Estimating relationships are developed statistically from historical data.

(2) Procurement costs may vary with system characteristics such as weight, speed, or range, or with costs of other items. As an example of the latter, the cost of spares may vary with the cost of the equipment. Some examples of cost to non-cost ER's are airframe procurement cost estimated as a function of airframe weight, computer cost estimated as a function of core storage capacity, or missile engine cost estimated as a function of thrust. The appropriate estimating relationships must be selected and the availability of statistical information must be considered. Techniques for developing ER's can be found in standard cost analysis textbooks, as well as Army and Air Force cost analysis handbooks. In addition to the basic relationships, costs are also influenced by factors such as production rate, quantities, and plant loading. An example of this technique follows.

AN/SPA X

42 x $932 = $39,144

Experience indicates that contracted costs of containers ran about $932 per square inch in FY 1995. The AN/SPA X is 42 square inches. The estimated cost is $39,144 which is computed by multiplying the number of square inches (42) in the AN/SPA X by the average cost per square inch ($932). This FY1995 contracted cost would then require escalation for inflation based on the current inflation indices and the planned year of purchase (See Chapter 2).

b. Specific Analogies. Specific analogies depend on the known cost of an item used in prior systems as the basis for the cost of a similar item in a new system.

Adjustments must be made to known costs to account for differences in production method, performance, design, and operational characteristics. For example, a new radar repeater's cost may be estimated based on actual cost of an existing repeater. An example of this technique follows.

AN/SPA X	
Direct Labor = 3,087	
Direct Labor @ $14.00/hr	$43,218.
Overhead @ $7.14/h	$22,041.
Total	$65,259.

This estimate is based on experience with the AN/SPA 4 and AN/SPA 25 repeaters. An average of 1.5 employees per month was devoted to manufacture in the first 9 months and one employee per month for the last 12 months for the AN/SPA 4. Based on this information and the technical similarity of the AN/SPA 4 and the AN/SPA X, it is estimated that 1.5 employees per month also will be required for the first 9 months. However, because the finishing procedures will be more similar to the AN/SPA 25 it is estimated that 1.25 employees per month will be required for the last 6 months. This results in total estimated man-months of 21 man months or 3,087 man-hours. (1.5 men x 9 mo. + 1.25 men x 6 months = 21 man months x 147 hrs./mo = 3,087 hrs.) Direct labor and overhead rates were obtained from the Navy Plant Representative Office at the XYZ Company (the AN/SPA X designer). Since these rates were in effect in FY 1995, the budget analyst would have to escalate this cost based on current inflation rates and the planned budget year (See Chapter 2).

c. Specialist Estimates. This method is usually applied when ER's and other estimating methods are not available or relevant. Specialists can also be used to assist in applying analogies or ER's. This method utilizes the subjective judgment of an experienced individual or group. Estimates developed on this basis are characterized by a lack of detailed rationale and analysis. While estimates based on expert opinion are occasionally both useful and necessary, they are normally highly uncertain and should not be the sole estimating method when time permits thorough analysis. An example of this method follows.

Mark IX $120,823K

A new launcher is required for the Parrot Missile. Dr. J., Design Division, , is an accepted expert in the field of design. He judged the MARK IX to be 2.5 times as complex as the MARK I due to the need for double insulation and nuclear hardening. The current price of the MARK I is $48,329 per unit. The MARK IV is estimated to cost $120,823 (2.5 times $48,329). Dr. J. stated that the estimate was based on FY 1995 budgeted costs for the MARK I. Escalation in accordance with the guidelines in Chapter 2 using the current indices would be necessary.

d. Rates, Factors, and Catalog Prices. Rates and factors can be obtained from DCAA, DCAS and government plant representative offices for various contractors. From this data combined with estimates of engineering and manufacturing hours required, the analyst can estimate future prices for the same or similar products. Catalog prices represent published prices for standard off-the-shelf products or services. When standard off-the-shelf products are required, this method provides relatively good cost data.

e. Industrial Engineering Standards (IES).

(1) IES's define and measure, in unit man-hours or dollars, the work content of the discrete tasks to be performed in accomplishing a given operation or producing an equipment component. IES's

represent average skills, times, and rates. Their use is limited to items whose content or specification can be explicitly described.

(2) An IES is developed as follows:

(a) A work statement, set of drawings, or specification is received or developed.

(b) Each engineering or production operation required to produce the item or accomplish the designated task is specified.

(c) The work stations where each operation will be performed are designated.

(d) The kinds of labor and material required to produce the item or accomplish the operation are given in detail. Tooling requirements are identified with man-hour and material estimates.

(e) studies are conducted to determine the most economical method of performing each operation.

(f) An estimated time standard for performing each task is established using both time-and-motion studies plus experience in performing similar tasks.

(g) Labor standards for specific operations may be combined to provide a labor standard for a component, subassembly, major equipment, or subsystem. Similar standards may be developed to cover waste, rework material, tooling, and engineering.

(h) Labor efficiency factors are used to adjust standard labor hours to actual labor hours. In general, labor efficiency, utilization, or effectiveness measures represent the ratio of standard hours planned to the actual hours expended for a given work operation.

(i) Periodically, time standards are adjusted to reflect changes in production methods. Over a period of years, some standards become stabilized to such an extent that they become plant, product, or industry standards.

(j) A cost estimate for an item may be developed by combining standard hours, labor efficiencies, and labor rates as follows:

$$\text{Cost} = \frac{\text{standard hours}}{\text{labor efficiency}} \times \text{labor rate}$$

f. <u>Cost Model Applications.</u>

A cost model consists of the logic used to derive a cost estimate. The unique contribution offered by a model is the application of the cost-estimating techniques. Additionally, the speed of manipulation of computerized models may be advantageous when many design alternatives are being costed. The simplest form of a model might be a checklist of program elements, used to avoid omitting relevant elements from an estimate. Each element would be estimated by the most appropriate techniques available. The most complex form might be a life-cycle estimating program complete with ER's, factors, analogy matrices, standards, and catalog prices.

g. Trend Analysis. Information in the Cost Performance Reports is especially helpful in analyzing future purchases during Full Scale Development or Production phases when the contractor reports under a validated cost/schedule control systems interim management information system.

(e) IESstudies are conducted to determine the most economical method of performing each operation.

(f) An estimated time standard for performing each task is established using both time-and-motion studies plus experience in performing similar tasks.

(g) Labor standards for specific operations may be combined to provide a labor standard for a component, subassembly, major equipment, or subsystem. Similar standards may be developed to cover waste, rework material, tooling, and engineering.

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$$\text{Cost} = \frac{\text{standard hours}}{\text{labor efficiency}} \times \text{labor rate}$$

8. Appropriation Determination. The last step in developing a base price is to determine the appropriation(s) in which the item is to be budgeted. The correct appropriation must be determined before the base price for a future purchase can be adjusted for inflation. (See DON Financial Management Policy Manual regarding appropriation cognizance.)

Chapter 2

Adjusting Price Estimates for Inflation

1. General. This chapter provides guidance on how to adjust price estimates of contracted purchases and services for the effects of inflation. Although specific inflation indices are provided for use in developing budget estimates, the application of these indices requires discretion. To apply these indices properly, the analyst should be aware of the importance of inflation forecasts in the development of the budget, have an understanding of the key terms and concepts used in measuring inflation, and have a knowledge of the detailed computations involved in adjusting price estimates for inflation. This chapter covers the policy guidance for budgeting for inflation, and it defines and explains some of the key terms and concepts involved in measuring inflation. It then identifies the steps to be followed in incorporating inflation estimates in budget prices and provides examples of the computations using price escalation indices. A discussion of the use of inflation estimates in budget presentations and justifications, including real program change analyses, is covered next. This chapter concludes with a summarization of the guidelines to be followed when applying inflation estimates and a brief discussion of the limitations on their use.

2. Policy Guidance. The allowance for future price increases due to inflation is an important aspect of the policy that budget estimates will reflect the most likely or expected prices. The fact that these inflation estimates must be consistent with the economic assumptions provided by the Office of Management and Budget (OMB) does not contravene that policy, but rather supports it.

   a. OMB Guidance.

      In building the annual President's Budget, OMB develops overall economic positions and programs for the Administration. Implicit and explicit assumptions are made as to the rate of inflation, unemployment levels, interest rates, levels of productivity, and the Gross Domestic Product. Based on these assumptions, OMB develops specific budget guidance and inflation rates to be used by all agencies in developing their budget estimates. It would be totally inconsistent for the Administration to develop a macro- economic plan as part of its budget estimates and then to include in those estimates prices that did not conform to expected results of that plan. Thus, OMB requires that budget estimates be consistent with the Administration's economic assumptions on the basis that these assumptions provide the best estimate for future inflation rates.

   b. OSD Guidance.

      In accordance with the economic assumptions approved by OMB, DOD(C) prescribes annual inflation rates to be used in all phases of the Planning, Programming and Budgeting System (PPBS). OSD rates apply to the Program

Objectives Memorandum (POM), the Department of the Navy (DON) and OSD/OMB Budget Submissions, the President's Budget Request, and the Future Years Defense Program (FYDP). These inflation rates provide the link between the Administration's macroeconomic forecast and the specific pricing contained in budget estimates.

c. DON Review Guidance.

The inflation rates issued by DOD(C) can only be applied to outlays. Accordingly, in addition to issuing these rates in budget guidance, issues inflation rates and indices for each appropriation that can be applied directly to Total Obligational Authority (TOA). The forecast rates of inflation issued in DON budget guidance must be used in preparing all budget estimates. The relationship between outlay and TOA indices and guidance on how to apply them in pricing is covered in section 4.

3. Key Terms and Concepts. Before entering a detailed discussion of the actual application of indices, the concept of inflation and some key terms are reviewed and placed in the context of developing budget estimates in the Department of the Navy.

a. Inflation and How It is Measured.

(1) Inflation is defined as an increase in the general level of prices in the economy. Inflation does not mean that prices rise evenly or that all prices are rising. Some may be constant, and others actually falling. For example, prices during recent years increased significantly while other prices remained fairly stable. Prices of some commodities rise faster than others because of differences in the magnitude and direction of changes in supply and demand in various markets.

(2) In order to understand the concept of inflation and how it is measured, it is necessary to understand "aggregate prices", "annual rate of change", and "index." The following example helps to define these concepts.

(a) Assume there are only three commodities in our economy: Wheat, wine, and jogging shoes, each representing 70, 20, and 10 percent of personal consumption expenditures. Further, assume that these proportions are fixed over time, and that the quality of the three items is always the same. The following table displays, for a five-year period, the individual prices of these commodities, an aggregate price for these commodities, the annual rate of change in the aggregate price, and an inflation index for this economy.

Year	Price of wheat (per bushel)	Price of wine (per Bottle)	Price of shoes	Aggregate price	Annual Rate of Change (Percent)	Inflation Index
1	$2.00	$5.00	$20.00	$4.40	N/A	1.000
2	2.10	5.50	21.00	4.67	6.1	1.061
3	2.20	6.00	24.00	5.14	10.1	1.168
4	2.30	6.50	26.00	5.51	7.2	1.252
5	2.40	7.00	30.00	6.08	10.3	1.382

(b) The aggregate price is computed by taking a weighted average of the commodity prices, with each price weighted by an item's contribution to total expenditures. It is computed for year one in the above example as follows:

.7($2.00) + .2(5.00) +.1(20.00) = $4.40.

The aggregate price is thus a notional price that is developed to measure changes in inflation. The relative mix of the items considered, and the change of that mix over time, will greatly affect the amount of inflation that is measured. Nevertheless, the measurement of inflation implicitly assumes that the relative mix of items and their quality remains the same for all years involved in the measurement.

(c) The annual rate of change in prices (inflation) is computed by dividing one year's aggregate price by the preceding year's aggregate price, and subtracting one from the result. In the above example it is computed for year three as follows:

(5.14/4.67) - 1 = .101 or 10.1%.

The annual rate of change thus measures the year-to-year change in prices.

(d) The inflation index is calculated by dividing the aggregate price in each year by the price in year one, called the base year. For example, in year 3, the index is calculated as:

5.14/4.40=1.168.

Alternatively, it is calculated by setting the base year equal to one, and then multiplying the index value of each year by one plus the annual rate of change of the next year. The computations from the above example are as follows:

Index Value for Year 1 = 1.000
Index Value for Year 2 = 1.000 X 1.061 = 1.061
Index Value for Year 3 = 1.168 X 1.101 = 1.168
Index Value for Year 4 = 1.168 x 1.072 = 1.252
Index Value for Year 5 = 1.252 x 1.103 = 1.382.

The inflation index thus measures the change in prices from a fixed point in time. It should be noted that inflation indices can be expressed in percentage terms. In such instances, the value will appear as 100.0 instead of as 1.000.

(3) The term "escalation" is often used interchangeably with the term "inflation". For example, the inflation indices issued by DOD(C) and FMB are called "price escalation indices". These terms are used interchangeably throughout this chapter.

b. Current and Constant Dollars. A brief definition of current and constant dollars and other terms commonly used with them is provided next.

Current Dollars. The dollar value of an item or service expressed in terms of the prices current at the time the item or service is procured. Also called then year dollars.

Constant Dollars. Dollar values adjusted by removing the effects of inflation. A constant dollar stream reflects the prices that would exist for the time period of the stream if prices and transactions were the same in every year as in the base (or reference) year.

Base Year. A point of reference representing a fixed price level. A base year is selected for developing an index or for developing price estimates.

Base Year Dollars. Dollars expressed in their value at the time of the specified base year of a program. Base year dollars are a specific kind of constant dollars.

Base Price. The price of an item expressed in base year dollars (constant dollars). When a price estimate is developed for an item, the base price should be established in base year dollars. This base price is then escalated (inflation beyond the base year added) to estimate the price in then year dollars.

c. Relationship of Outlays to TOA.

(1) While inflation rates are developed in terms of outlays (expenditures), price estimates for the budget must be developed in terms of . In order to properly adjust price estimates for the effects of inflation, it is necessary to understand the relationship of outlays to TOA.

(2) Both outlays and TOA are expressed in terms of a fiscal year. However, the term fiscal year used with outlays has a different meaning than it does used with TOA.

(a) For outlays, the fiscal year indicates the time period in which the outlays are incurred. All outlays designated by a fiscal year occur during that single fiscal year. For example, the phrase "FY 1998 outlays of $100 million" means that $100 million is expended (or will be expended) during FY 1998 from all appropriations available for expenditure. The TOA from which these outlays came might be as follows:

(In Millions of Dollars)	
Year in Which TOA Appropriated	FY 1998 Outlays
FY 1998	20
FY 1997	40
FY 1996	30
FY 1995	10
Total	**100**

The outlays in a given fiscal year consist of parts of from that year and previous years. In the above example, $80 million of the total of $100 million in FY 1998 outlays came from TOA budgeted from FY 1995 through FY 1997.

(b) For , the fiscal year indicates the time period in which the (or budget authority) is first available for obligation and subsequent expenditure. While all TOA appropriated for multi-year accounts could be spent in that first year, normally it is expended over a period of several years. For example, the phrase "FY 1998 TOA of $100 million" means that $100 million is (or is planned to be) available for obligation beginning in FY 1998. Outlays for this TOA might occur as follows:

(In Millions of Dollars)				
	Outlays			
TOA for FY 1998	FY 1998	FY 1999	FY 2000	FY 2001
100	20	40	30	10

The TOA of a given year appears as an outlay in that year and in subsequent years as work is performed and costs incurred. In the above example, $80 million of the total of $100 million FY 1998 TOA will expend from FY 1999 through FY 2001.

d. Inflation in DON Budget Estimates.

(1) Inflation is a measure of prevailing prices, or costs of labor and material, at the time work is performed or costs are incurred. Because outlays occur relatively close to the point in time that costs

are incurred, they are used to relate inflationary changes in the general economy to the estimates included in the Department's budget.

(a) Inflation that occurs during the time period of a fiscal year impacts directly on the outlays made during that time period. Thus, it also impacts on the of several fiscal years before that time period. In the example in paragraph c.(2)(a), the rate of inflation in FY 1998 had to be incorporated into price estimates not only for programs budgeted in FY 1998, but also for programs budgeted in FY 1995, FY 1996, and FY 1997.

(b) When the outlays from a single fiscal year's occur over more than one fiscal year, the rate of inflation for more than one fiscal year is included in that year's TOA. In the example in paragraph c.(2)(b), price estimates for programs budgeted in FY 1998 had to accommodate forecasted rates of inflation not only for FY 1998 but also for FY 1999, FY 2000 and FY 2001.

(2) DOD(C) provides guidance on price changes due to inflation in the form of annual rates which are to be applied to outlays. These annual rates are similar to those illustrated above in the three item economy. These rates are sometimes referred to as raw rates because they measure the amount of inflation occurring in a 12-month (fiscal year) period (assuming that goods ordered will be delivered and paid for in that 12-month period). They are directly comparable to popular indices such as the Consumer Price Index (CPI). They are used to adjust all price estimates in the DON budget for the effects of inflation either through direct application to base price estimates or indirectly through the use of conversion factors or TOA indices, both of which are computed from outlay indices.

(3) The distinction between outlays and that was described above must be kept in mind when adjusting prices for the effects of inflation. This distinction requires the use of different terms when describing inflation adjustments made to outlays as opposed to inflation adjustments made to TOA. Both outlays and TOA can be expressed in current or constant dollars.

(a) For outlays, current and constant dollars are as defined in paragraph b above. The prices associated with outlays cover a single fiscal year. To distinguish them from , the expression "fiscal year dollars" is used. The inflation index which is created for application to outlays is referred to as the "outlay index".

(b) For TOA, current and constant dollars have a different meaning because the prices associated with them cover more than one fiscal year (until the work is performed, costs are incurred, or expenditures made). To distinguish them from outlays, the expression "budgeted (or budget) dollars" is used. The inflation index which is created for application to TOA is referred to as the "TOA index".

(c) It is often necessary to convert estimates in constant fiscal year dollars to budgeted dollars, or vice versa. This conversion process requires the "fiscal year phasing" of the estimate, that is, identifying the specific fiscal years in which the actual work is performed or costs incurred. Fiscal year phasing can be accomplished using specific information or standard appropriation "outlay rates" (percentage of that expends each year). The conversion from constant fiscal year dollars to budgeted dollars, or vice versa, can be accomplished by using a "TOA conversion factor". Section 4 describes these terms in more detail and provides examples of the computations involved.

4. The Application of Inflation Indices. This section describes how inflation estimates are to be applied to price estimates included in the budget. After outlining the major steps involved, it explains how to create and use an outlay index, a conversion factor, and a TOA index. It concludes with a discussion of the differences in these three computational tools. It should be noted that the examples in this section are rounded to three decimal places in order to simplify the presentation. Because of this rounding, many of the calculations displayed may not be exact. Whenever calculations using indices are performed, as many decimal places as possible should be carried throughout the calculation to minimize rounding errors.

a. Steps in the Process.

(1) The first step is to obtain the current approved inflation guidance. As indicated earlier, FMB periodically issues new inflation guidance which has been received from DOD(C). Generally, this guidance is in the form of revised annual inflation rates for outlays by major category (e.g., Fuel, Pay , and Other Purchases) and indices and annual rates of change for TOA by appropriation.

(2) The second step is to determine if the base price has been developed in fiscal year dollars or if it includes inflation beyond the base year, (e.g., it is based on budgeted or contracted prices). The base price may be in either form, but it is essential to the selection of subsequent computations that the form is known.

(3) The third step is to determine the fiscal year phasing of the purchase. If this information is not known, standard appropriation outlay rates may be used.

(4) The fourth step is to select the appropriate index and computational method to adjust the base price estimate to a budget estimate for a specific fiscal year.

(5) The fifth and final step is the actual computation.

b. Creation of an Outlay Index.

(1) As indicated earlier, the annual inflation rates for outlays are the basic components for creating indices which are used in all pricing computations. The method of creating an outlay index is the same as that illustrated in paragraph 3c above in the example of a three item economy. Annual rates are converted to a new escalation index for outlays by compounding the rates from a predetermined base year. The choice of a base year is largely unimportant for the purpose of calculating an index because once an index is computed with a given base year, it is relatively simple to convert it to an index with a different base year. It is necessary when using an index, however, to convert it to the same base year as that used for the base price.

(2) The following table illustrates the process of deriving an outlay escalation index with one base year and converting it to another base year.

Fiscal Yea	Annual Inflation Rate (percent)	Conversion to Index	Index FY 1995 Base	Conversion to Base Year FY 1998	Index FY 1998 Base
1982	-		1.000	-1.255	.797
1983	8.0	1.000 X 1.080	1.080	- 1.255	.861
1984	8.6	1.080 X 1.086	1.173	- 1.255	.935
1985	7.0	1.173 X 1.070	1.255	- 1.255	1.000
1986	6.4	1.255 X 1.064	1.335	- 1.255	1.064
1987	5.4	1.335 X 1.054	1.407	- 1.255	1.122
1988	5.4	1.407 X 1.054	1.483	- 1.255	1.182
1989	5.4	1.483 X 1.054	1.563	- 1.255	1.245

(a) As can be seen in the table, the process begins with the annual inflation rate. Fiscal Year 1982 is determined to be the base year and assigned a value of one. Each fiscal year index value is derived by a compounding process as follows: the previous year's index value is multiplied by one plus the annual rate. For example, for FY 1998, the index value for FY 1997 (1.173) is multiplied by the annual inflation rate plus one (1.070) to obtain the 1985 index (1.255).

(b) To create an index with a different base year, each index value is divided by the value in the new base year. In the above example, the index for FY 1998 (1.255) is divided into each value in the base year FY 1995 index to derive a base year FY 1998 index.

c. Uses of an Outlay Index.

(1) As the name indicates, an outlay index is used to convert outlays from current to constant dollars and vice versa. Such calculations are performed to evaluate real changes in outlays at the Departmental, appropriation, or program levels. Calculations using an outlay index are also performed, however, in developing price estimates. An outlay index is used to compute the amount of inflation to be added to a base price, to adjust a base price to put it in constant fiscal year dollars, and to estimates when a new set of inflation indices is issued. The following paragraphs provide examples of the use of outlay indices.

(2) The first example illustrates how outlays are converted from current to constant dollars. The table below displays assumed outlays in current dollars for for a five-year period, an assumed outlay index with base year FY 1998, and the computed outlays in constant dollars.

(In Millions of Dollars)					
	FY 1998	**FY 1999**	**FY 2000**	**FY 2001**	**FY 2002**
Outlays in Current Dollars	8,000	9,000	10,000	11,000	12,000
Index Value	1.000	1.064	1.122	1.182	1.245
Outlays in Constant FY 1998	8,000	8,459	8,913	9,306	9,639

For 1986 the current dollar value ($9,000 million) is divided by its corresponding outlay index value (1.064) to obtain the constant dollar equivalent ($8,459 million). Each successive value is obtained in the same manner. To convert from constant to current dollars, the computation is reversed: the constant dollar value is multiplied by the corresponding index value.

(3) The next example illustrates how to compute the amount of inflation to be added to a base price developed in fiscal year dollars. In Chapter I, paragraph 7b, an estimate of $65,259 was developed for a repeater using prices that were in effect during FY 1995 (constant FY 1995 dollars). It is estimated that 30% of the work will be completed the first year, 55% the second year, and the remaining 15% the third year when the item is delivered. An outlay index with base year FY 1995 must be used to escalate the base price estimate. The following table displays the cost of the work completed phased by fiscal year and the application of outlay indices to these phased costs to determine the price that should be budgeted in FY 1998.

	FY 1998	**FY 1999**	**FY 2000**
Cost Estimate in Constant FY 1995 Dollars	$65,259		
Phased Costs	$19,578	$35,892	$ 9,789
Outlay Index (Base Year FY 1995)	1.255	1.335	1.407
Escalated Phased Costs	$24,570	$47,915	$13,773
Escalated Cost Estimate	$86,259	-	-

The phased costs are expressed in constant FY 1995 dollars (or base year 1982 dollars) and are escalated by multiplying them by the appropriate outlay index value. These escalated phased costs are summed to provide the fully escalated costs that should be included in the FY 1998 budget. The amount that should be budgeted in FY 1998 is $86,259; the increase of $21,000 over the base price estimate results from inflation occurring from FY 1995 to FY 2000.

(4) The next example illustrates the use of an outlay index when specific information requires a modification to the index. Using the same information from subparagraph (3), assume in addition that the manufacturer has signed a labor contract that calls for a 15% wage increase in FY 1996 followed by a 10% increase in FY 1997. Since budget pricing policy requires that specific

information be used when known, this labor rate increase must be used in developing a price estimate. Three alternative ways of escalating this cost estimate are presented to illustrate the kinds of computations that can be done with indices. The analyst can use whichever method is preferred.

(a) The first method involves two indices. A special index for labor must be created by using the known increases for FY 1996 and FY 1997 and the approved inflation rates for outlays for FY 1998-FY 2000. The following is the annual rate of change for labor and resulting index with a base year of FY 1995.

Labor Index						
	FY 1995	FY 1996	FY 1997	F Y 1998	FY 1999	FY 2000
Rate of Change	N/A	15.0	10.0	7.0	6.4	5.4
Index	1.00	1.150	1.265	1.354	1.440	1.518

The approved outlay index with base year FY 1995 is used for other costs. It is estimated that 60% of the cost of the repeater represents labor at the manufacturer's plant. The costs are split between labor and other costs and the appropriate index is applied to each category.

	F Y 1998	FY 1999	FY 2000
Cost Estimate in Constant FY 1995 Dollars	$65,259	-	-
Labor Costs	$39,155	-	-
Phased Labor Costs	$11,747	$21,535	$5,873
Labor Index	1.354	1.440	1.518
Escalated Labor Costs	$15,905	$31,010	$8,915
Other Costs	$26,104	-	-
Phased Other Costs	$7,831	$14,357	$3,916
Other Cost Index	1.255	1.335	1.407
Escalated Other Costs	$9,828	$19,167	$5,510
Escalated Cost Estimate	$90,335	-	-

The amount that should be budgeted is $90,335, the sum of the escalated labor costs and escalated other costs.

(b) The second method involves the construction of an index weighted between labor (60%) and other costs (40%). Such an index is computed as follows.

	Labor Index	Other Cost Index	Weighted Index
FY 1998	1.354 x .6 = .812	1.255 x .4 = .502	1.314
FY 1999	1.440 x .6 = .864	1.335 x .4 = .534	1.398
FY 2000	1.518 x .6 = .911	1.407 x .4 = .563	1.474

Since this weighted index takes into account the split between labor and other costs, it can be applied to the total cost estimate in the same manner as the outlay index was in the example in paragraph (3). The computations are shown in the following table.

	FY 1998	FY 1999	FY 2000
Cost Estimates in Constant FY 1995 Dollars	$65,259	-	-
Phased Costs	$19,578	$35,892	$ 9,789
Weighted Outlay Index	1.314	1.398	1.474
Escalated Phased Costs	$25,725	$50,177	$14,429
Escalated Cost Estimate	$90,331	-	-

The FY 1998 budgeted cost of $90,331 differs slightly from the answer obtained above only because of rounding included in the two computations.

(c) The third way of computing escalation in this example is to adjust the base price to FY 1997 constant dollars before escalating it to FY 1998 budgeted dollars. The FY 1997 base price estimate will then take into account the known labor rate increases for FY 1996 and FY 1997. First the estimate of $65,259 in FY 1995 dollars is split into labor ($39,155) and other ($26,104) costs. Labor costs are escalated to FY 1997 costs using the labor index ($39,155 x 1.265 = $49,531) and other costs using the approved outlay index ($26,104 x 1.173 = $30,620). The estimated price in FY 1997 dollars is then $80,151. The same computational method that was used in paragraph (3) is now followed, substituting this new FY 1997 base price and an outlay index with base year 1984. An outlay index with base year FY 1997 is computed as follows.

	Outlay Index Base Year FY 1995	Conversion To Base Base Year FY 1997	Outlay Index Base Year FY 1997
FY 1997	1.173	- 1.173	1.000
FY 1998	1.255	- 1.173	1.070
FY 1999	1.335	- 1.173	1.138
FY 2000	1.407	- 1.173	1.200

This computation is completed in the following table.

	FY 1998	FY 1999	FY 2000
Cost Estimates in Constant FY 1997 Dollars	$80,151	-	-
Phased Costs	$24,045	$44,083	$12,023
Weighted Outlay Index Base Year 1997	1.070	1.138	1.200
Escalated Phased Costs	$25,728	$50,167	$14,427
Escalated Cost Estimate	$90,322	-	-

The FY 1998 budgeted cost of $90,322 differs slightly from the answers obtained above only because of rounding included in the computations.

(5) The next example illustrates how to escalate a base price to budgeted dollars when the base price is not in constant fiscal year dollars. In Chapter I, paragraph 7.a.(2), a cost estimate of $39,144 was developed for containers based on previously contracted prices in FY 1995. Before converting the cost estimate to FY 1998 budgeted prices, it is necessary to first convert it to constant FY 1995 prices. Since these containers were produced over a two-year period (40% of the work completed in FY 1995 and 60% in FY 1996) the FY 1995 contracted price includes anticipated inflation in FY 1996. The specific amount of inflation which will occur in FY 1996 is not known. Accordingly, it is necessary to assume that the rate of inflation included in the contract for FY 1996 is the same as that provided by the approved inflation rates for outlays. An outlay index is used to convert the base price estimate to either constant FY 1995 dollars or constant FY 1996 dollars. Both conversions are shown in the following paragraphs for illustrative purposes.

(a) The method of removing FY 1996 inflation from the base price estimate to create an estimate in constant FY 1995 dollars is illustrated in the following table.

	FY 1995	FY 1996
Cost Estimates in Constant FY 1995 Contract	$39,144	-
Phased Costs	$15,658	$23,486
Outlay Index (Base Year FY 1995	1.000	1.080
Phased Costs (Constant FY 1995 Dollars)	$15,658	$21,746
Cost Estimate in Constant FY 1995 Dollars	$37,404	-

The cost estimate is phased as though it were contracted in FY 1995 and each phased cost value is divided by the outlay index value to convert these costs to constant FY 1995 dollars. The sum of the phased costs ($37,404) then becomes the cost estimate in constant FY 1995 dollars (a new base price estimate). In FY 1998, however, it is expected that 50% of the work will be completed in FY 1998 and 50% in FY 1999. The procedure for converting these costs to FY 1998 budgeted prices is similar to that illustrated in paragraph (3). The computation is displayed in the following table.

	FY 1998	FY 1999
Cost Estimates in Constant FY 1995 Contract	$37,404	-
Phased Costs in Constant FY 1995 Dollar	$18,702	$18,702
Outlay Index (Base Year FY 1995)	1.255	1.335
Phased Costs (Constant FY 1995 Dollars)	$23,741	$24,967
Cost Estimate in Constant FY 1995 Dollars)	$48,438	-

The escalated cost estimate of $48,438 is the amount which should be included in the FY 1998 budget.

(b) The method of adding FY 1996 inflation to the base price estimate to create an estimate in constant FY 1996 dollars is illustrated in the following table.

	FY 1995	FY 1996
Cost Estimates FY 1995 Contract	$39,144	-
Phased Costs	$15,658	$23,486
Outlay Index (Base Year FY 1996)	.926	1.000
Phased Costs (Constant FY 1995 Dollars)	$23,741	$24,967
Cost Estimate in Constant FY 1995 Dollars)	$48,438	-

The computation is the same as in paragraph (a) except that an outlay index with a base year of FY 1996 is used. This index is created from the index in FY 1995 by dividing the values for each year by the value for FY 1996 (1.000/1.080 = .926 and 1.080/1.080 = 1.000). The sum of the phased costs ($40,395) now represents the base price estimate in constant FY 1996 dollars.

The procedure for converting this estimate to FY 1998 budget costs is also the same as that used in paragraph (a) above except that an outlay index with base year FY 1996 is used. The computations are illustrated in the following table.

	FY 1998	FY 1999
Cost Estimates FY 1996 Dollars	$40,395	
Phased Costs in Constant FY 1996 Dollars	$20,198	$20,197
Outlay Index (Base Year FY 1996)	1.162	1.236
Escalated Phased Costs	$23,470	$24,963
Escalated Cost Estimate	$48,433	-

The outlay index with base year FY 1996 was derived from the index with base year FY 1995 by dividing each value by the FY 1996 value (1.255/1.080 = 1.162 and 1.335/1.080 = 1.236). The escalated cost estimate of $48,433 differs slightly from that contained in paragraph (a) above only because of rounding in the two computations.

(6) The final example illustrates how to make pricing adjustments when a revised set of inflation rates is issued. This adjustment requires computations with two indices: the first to remove the earlier estimate of inflation and the second to add the new estimate. The following table displays the outlay inflation rates and index used in the previous examples (labeled old) and a set of new rates and the corresponding index.

	Old Annual Rate	Old Index	New Annual Rate	New Index
FY 1995	-	1.000	-	1.000
FY 1996	8.0	1.080	7.0	1.070
FY 1997	8.6	1.173	6.2	1.136
FY 1998	7.0	1.255	5.6	1.200
FY 1999	6.4	1.335	5.0	1.260
FY 2000	5.4	1.407	4.7	1.319
FY 2001	5.4	1.483	4.7	1.381
FY 2002	5.4	1.563	4.7	1.446

The table below illustrates the steps required to revise fully escalated budget estimates when new indices are issued, using the fully escalated cost estimate of $86,259 from paragraph (3) above.

(In Thousands of Dollars)			
	FY 1998	FY 1999	FY 2000
Cost Estimate (FY 1998 Budget)	$86,259	-	-
Phased Costs	$24,570	$47,915	$13,774
Old Index	1.255	1.335	1.407
Phased Costs in Constant FY 1995 Dollars	$19,578	$35,892	$9,789
New Index	1.200	1.260	1.319
Revised Phased Costs	$23,494	$45,224	$12,912
Revised Cost Estimate FY 1998 Budget	$81,630	-	-

As can be seen, the old phased costs are divided by the appropriate old index values to create phased costs in constant FY 1995 dollars. These constant dollars are then multiplied by the appropriate new index values to fully escalate the budget estimate under the new economic assumptions. In order to adjust fully for the change in inflation rates, the base year used for both the old and the new index must be the same base year that was used to develop the original price estimate. This same procedure is followed for adjusting prices in all fiscal years.

d. The TOA Conversion Factor.

(1) The examples in section c involve the application of outlay indices to convert base price estimates in constant fiscal year dollars to budgeted dollars and vice versa. A factor, called the TOA conversion factor, can be created to accomplish this conversion much more simply. A TOA conversion factor is derived by dividing the constant fiscal year dollars into the budgeted dollars (that is, the cost estimate in constant FY 1995 dollars into the escalated cost estimate). The TOA conversion factors for each of the examples used in section c are as follows:

EXAMPLE	**FY 1998 BUDGETED DOLLARS**	**FY 1995 CONSTANT FISCAL YEAR DOLLARS**	**CONVERSION FACTOR FY 2000**
Paragraph c.(3)	86,259	-65,259	= 1.322
Paragraph c.(4)(a)	90,335	-65,259	= 1.384
Paragraph c.(5)(a)	48,438	-37,404	= 1.295

If the estimate is in constant fiscal year dollars, multiplication by the TOA conversion factor converts it to budgeted dollars (e.g. $65,259 x 1.322 = 86,259). If the estimate is in budgeted dollars, division by the TOA conversion factor converts it to constant fiscal year dollars (e.g. $86,259/1.322 = $65,259).

(2) A TOA conversion factor is a useful concept only if it can be generalized to apply to more than one estimate which is the case only when estimates for different programs are phased identically by fiscal year. The one case where this generally occurs is when price estimates are assumed to be phased the same as the standard outlay rates for an appropriation. Thus a TOA conversion factor can be used to convert estimates from constant fiscal year dollars to budgeted dollars, or vice versa, whenever a price estimate is phased using the standard appropriation outlay rates.

(3) A TOA conversion factor using standard appropriation outlay rates is created by removing anticipated inflation from a fully escalated cost estimate and comparing that constant dollar estimate to the original escalated estimate. Because a standard factor is being computed, the value of 1.0 is assigned to TOA (fully escalated cost estimate) with the outlay rate values used as the phased cost. The following illustrates this computation using the OPN appropriation as an example. The OPN outlay rates are as follows:

	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**
OPN Outlay Rates	.13	.35	.26	.11	.15

The method for computing a TOA conversion factor to convert constant FY 1995 dollars to FY 1995 budgeted dollars is as follows:

	FY 1995	**FY 1996**	**FY 1997**	**FY 1998**	**FY 1999**
TOA (Fully Escalated Cost Estimate)	1.0				
Escalated Phased Costs (Outlay Rate)	.13	.35	.26	.11	.15
Outlay Index (Base Year FY 1995)	1.000	1.080	1.173	1.255	1.335
Phased Costs (Constant FY 1995 Dollars)	.130	.324	.222	.088	.112
Cost Estimate in FY 1995 Constant Dollars	.876				
TOA Conversion Factor	1.142				

The phased costs in constant FY 1995 dollars are computed by dividing the escalated phased costs (outlay rates) by the values in the outlay index. The cost estimate in constant FY 1995 dollars is the sum of the phased costs in constant FY 1995 dollars. The conversion factor is then computed by dividing the fully escalated cost estimate by the cost estimate in FY 1995 dollars (1.0/.876 = 1.142).

The method for computing a TOA conversion factor to convert constant FY 1995 dollars to FY 1996 budgeted dollars is as follows:

	FY 1996	**FY 1997**	**FY 1998**	**FY 1999**	**FY 2000**
TOA (Fully Escalated Cost Estimate)	1.0				
Escalated Phased Costs (Outlay Rate)	.13	.35	.26	.11	.15
Outlay Index (Base Year FY 1995)	1.080	1.173	1.255	1.335	1.407
Phased Costs (Constant FY 1995 Dollars)	.120	.298	.207	.082	.107
Cost Estimate in FY 1995 Constant Dollars	.815				
TOA Conversion Factor	1.227				

As can be seen the method is similar except that the computation begins with FY 1996 (rather than FY 1995) and extends through FY 2000 (rather than FY 1999). Similar calculations produce the following TOA conversion factors for the indicated fiscal years.

FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002
1.142	1.227	1.309	1.388	1.465	1.544	1.627	1.715

These factors can be used to convert any program in the OPN appropriation that is phased using standard outlay rates from constant FY 1995 dollars to budget dollars in the indicated fiscal year.

e. Examples of the Use of a TOA Conversion Factor

(1) The TOA conversion factor can be used for pricing only when the fiscal year phasing of the item being priced can be assumed to be the same as the standard appropriation outlay rate. Whenever this assumption can be made, it provides a much shorter method of computing the impact of inflation on cost estimates because the effects of time phasing already have been built into the factor. The following paragraphs provide examples of the calculations involved when using the TOA conversion factor.

(2) In the example contained in paragraph c.(3) above, a repeater costing $65,259 in constant FY 1995 dollars was converted to FY 1998 budgeted cost estimate of $86,259 assuming a specific three-year phasing. If we do not know a specific fiscal year phasing for this item, but assume it is phased by the standard appropriation outlay rate, the FY 1998 budgeted costs are computed as follows.

$65,259 x 1.388 = $90,579

The constant FY 1995 costs are multiplied by the TOA conversion factor for FY 1998, resulting in a budget cost of $90,579 in FY 1998. The higher budgeted cost in FY 1998 ($90,579 vs $86,259) illustrates the sensitivity of pricing estimates to time phasing. The budgeted cost of the repeater in FY 1999 can also be obtained by the same simple calculation.

$65,259 x 1.465 = $95,604

In this case, the TOA conversion factor for FY 1999 was used.

(3) A conversion factor can also simplify the computations required to convert budgeted prices when a new inflation index is issued. In paragraph c.(6) above, an example was provided of the computations involved in repricing a program when new indices are issued. If we assume that the program to be repriced is phased using the standard appropriation outlay rates, then the following computations should be made. First, a TOA conversion factor based on the new indices must be calculated, using the same method described in d.(3) above. These factors are provided in the following table.

	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002
New Factors	1.115	1.180	1.243	1.305	1.366	1.431	1.498	1.568

Any program in the OPN appropriation that is phased using standard outlay rates can be repriced by dividing the program value by the old TOA conversion factor and multiplying the result by the new TOA conversion factor. For example, a repeater was budgeted at $90,579 in FY 1998 in paragraph (2) above. The following computation reprises this program using the new indices.

$90,579/1.388 = $65,259

$65,259 x 1.305 = $85,163

(4) Even when a program is phased differently than the standard appropriation rate, the use of conversion factors for repricing can provide a close approximation of the impact of a new inflation index. For example, the FY 1998 budgeted costs of the repeaters using a specific phasing is $86,259 (as computed in paragraph c.(3) above). The cost using the new indices and this specific phasing is $81,630 (as computed in paragraph c.(6) above). The following computation provides the same conversion using the TOA conversion factors.

$86,259/1.388 = $62,146

$62,146 x 1.305 = $81,101

The difference in the new FY 1998 budgeted price is only $529, less than .7% difference.

(5) One additional calculation allows the creation of another factor that saves a step when computing the impact of a new inflation index for a specific budget estimate. By dividing the new conversion factor by the old TOA conversion factor, a factor is created which converts directly from the old budgeted costs to new budgeted costs in one step (e.g. 1.180/1.227 = .962). The following are the factors to convert from the old to the new index obtained for each year of the OPN appropriation.

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002
Index Conversion Factor	.962	.950	.940	.933	.926	.920	.914

If the FY 1998 factor (.940) is multiplied by the amount budgeted for the repeater in FY 1998, the same result as in the two step procedure illustrated in paragraph (3) above is obtained ($90,579 x .940 = $85,163).

f. The TOA Index.

(1) A TOA index measures the impact of changes in inflation on TOA, given a specific fiscal year phasing of work performed (or outlays). It differs from a TOA conversion factor in that the latter converts constant fiscal year dollars to TOA while the TOA index converts TOA from one year to another. It can be created from any phasing of the actual accomplishment of work or incurrence of costs for which TOA is expended. However, it is usually developed using the standard outlay rates (which are used as a proxy for the phasing of work performed) for an appropriation. Normally, then, the term TOA index refers to one created for a specific appropriation using standard outlay rates.

(2) In pricing or repricing estimates for the impact of inflation or change in the rate of inflation, an implicit or explicit TOA conversion factor was used to convert program values from TOA to constant fiscal year dollars or vice versa. In paragraph d.(3) above, an explicit conversion factor was computed for OPN. A TOA index is computed directly from this conversion factor.

(a) The conversion factors computed for OPN were as follows:

FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002
1.142	1.227	1.309	1.388	1.465	1.544	1.627	1.715

(b) To create a TOA index for OPN, it is necessary to divide the stream by the factor in the year desired to be the base year. Thus, to establish a TOA index with base year FY 1995, each factor is divided by 1.142 resulting in the following index.

	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002
OPN TOA Index	1.000	1.074	1.146	1.215	1.283	1.352	1.425	1.502

(c) Like all indices the base year can be shifted by dividing by the value in the year which is to be the base year. For example, to convert the above index to a base year of FY 1998, each value in the index is divided by 1.215, resulting in the following new index.

FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002
.823	.884	.943	1.000	1.056	1.113	1.173	1.236

(3) The TOA annual rate of change can be computed from the TOA index. The annual rate of change for a given year is computed by dividing the year's index value by the previous year's index value and subtracting one. For example, the annual rate of change in the OPN appropriation for FY 1998 is as follows:

(1.000/.943) - 1 = .060 or 6.0%

(a) The following are the TOA annual rates of change for OPN, computed in this manner:

	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002
Percent	-	7.4	6.7	6.0	5.6	5.4	5.4	5.4

(b) The TOA annual rate of change measures the change in budgeted inflation from year-to-year, while the TOA index measures the budgeted change in inflation from a fixed fiscal year.

g. Uses of a TOA Index.

(1) A index can only be used to price estimates when two criteria are met. The underlying inflation index (outlay index) must not have changed and the program value to be adjusted must have phased costs that follow the same pattern as the standard appropriation outlay rates. When these two criteria are met, the use of a TOA index allows the quick accomplishment of a long and complex computation.

(2) The most common use of a TOA index is in the conversion of budgeted dollars from one year to another. When a program is shifted from one fiscal year to another in the budget, the TOA index is used to adjust for the impact of inflation on this change. To move a program forward in time, a TOA index is used which has the same base year as that in which the program is funded. The program value is multiplied by the index value of the year in which the program is to be moved. To move a program from a future year back to the base year, the program value is divided by the index value for that year. The following examples illustrate this computation. The OPN TOA index with a base year of FY 1998 is as follows:

FY 1998	FY 1999	FY 2000
1.000	1.056	1.113

(a) A program included in the FY 1998 budget at $5,100 thousand has been deferred until FY 1999. The cost in FY 1999 is computed as follows:

$5,100 x 1.056 = $5,386

(b) Another program planned for FY 2000 at a cost of $10,300 thousand has been accelerated to FY 1998. The cost in FY 1998 is computed as follows:

$10,300/1.113 = $9,254

(c) Both examples implicitly assume that the fiscal year phasing of the work performed in these programs is the same as the standard OPN outlay rate.

(3) A TOA index may also be used in price estimating whenever the raw estimate is based on historical budgeted costs. The example in Chapter 1, paragraph 7.c., of a cost estimate for a new launcher was based on a comparison of the budgeted price of another model. The estimate of $120,823 is thus based on what would have been budgeted in FY 1995. Again, assuming the fiscal year phasing of the work to be performed is the same as the standard appropriation rates, then a TOA index can be used to determine the amount that should be budgeted in FY 1998. Using an OPN index with a base year of FY 1995, the computation follows:

$120,823 x 1.215 = $146,800

Thus, $146,800 should be included in the FY 1998 budget for the launcher.

(4) A TOA index may also be used in combination with a TOA conversion factor in pricing. In paragraph e.(2) above, a cost estimate of $65,259 in constant FY 1995 dollars was converted to FY 1998 and FY 1999 budgeted estimates by use of TOA conversion factors as follows.

FY 1998: $65,259 x 1.388 = $90,579

FY 1999: $65,259 x 1.465 = $95,604

After converting the estimate to FY 1998 budgeted dollars, a TOA index can also be used to convert FY 1998 estimate to FY 1999 budgeted dollars. The computation is as follows.

$90,579 x 1.056 = $95,651

The FY 1998 budget estimate of $90,579 is multiplied by the TOA index value of 1.056 for FY 1999 (base year FY 1998) to yield the FY 1999 budgeted cost of $95,651. The difference of $47 obtained in the two answers is caused by the rounding involved in the two computations.

h. Differences between an Outlay Index, a TOA Conversion Factor and a TOA Index.

(1) It is important that the distinction between an outlay index, a TOA conversion factor, and a TOA index be fully understood. All three are used to measure changes in inflation from a base year, but each measures the change from a different perspective and for a different purpose. The following table displays the outlay index, the TOA conversion factor, and the TOA index for OPN computed for base year FY 1995.

	FY 1995	FY 1996
Outlay Index	1.000	1.080
TOA Conversion Factor	1.142	1.227
TOA Index	1.000	1.074

(2) An outlay index measures the change in inflation by comparing prices prevailing in the base year (assuming all work was completed or expenditures made in the same year) with prices prevailing in other years. For example, if a truck is budgeted, procured, and paid for in a single fiscal year and costs $25,000 in 1982, the cost of an identical truck in FY 1996, is computed by using the outlay index. The FY 1995 cost ($25,000) is multiplied by the index value for FY 1996 (1.080) to compute the FY 1996 estimated cost ($27,000). The difference ($2,000) is the amount of inflation that has occurred since FY 1995 (or during FY 1996).

(3) A TOA conversion factor measures the change in inflation by comparing prices prevailing in the base year with TOA in other years (assuming more than one fiscal year is necessary to complete the work funded with the TOA or to expend the TOA).

(a) For example, assume that the truck costing $25,000 if budgeted, procured, and paid for in FY 1995 will be budgeted in FY 1995, but built and paid for according to the standard outlay schedule for OPN, and delivered at the end of that period. The costs can be phased using the standard outlay rates and the amount of escalation can be computed using the outlay index, or a TOA conversion factor based on the standard outlay rates can be applied directly to the costs. The latter is much easier. The constant FY 1995 dollar cost ($25,000) is multiplied by the TOA conversion factor for FY 1995 (1.142) to compute the amount that would have to be budgeted in FY 1995 ($28,550). Because of the effect of inflation over a five-year period (FY 1995 - FY 1999), the truck is estimated to cost $3,550 more ($28,550-$25,000) than it would if it were built entirely in FY 1995.

(b) Similarly, if the same truck is budgeted in FY 1996 with a five-year building period, the $25,000 estimate is multiplied by the TOA conversion factor for FY 1996 (1.227) to obtain a budgeted cost of $30,675. This truck costs $5,675 more ($30,675 - $25,000) to buy in FY 1996 because of inflation that has occurred over a six-year period (FY 1995 - FY 2000).

(4) The TOA index measures the change in inflation by comparing TOA in a base year with TOA in other years. Using the same example of the truck which was earlier determined to cost $28,550 if it were budgeted in FY 1995 with a five-year building period, the FY 1996 budgeted cost is computed by multiplying this value by the FY 1996 TOA index (1.074). The FY 1996 cost is thus $30,675, an increase of $2,125 over the FY 1995 budgeted costs. This increase represents the amount of additional inflation required in the FY 1996 budget as compared to that required in the FY 1995 budget, or the amount of additional inflation that occurs during the period FY 1995 - FY 2000 as compared to the period FY 1995 - FY 1999.

5. Other Uses of Inflation Estimates. In addition to their use in pricing budget estimates, the inflation rates developed by OMB are used to prepare constant dollar analyses at the appropriation, appropriation title, DON, and DOD levels for a variety of purposes.

a. Development of Constant Dollar Estimates.

(1) Although constant dollar analyses are sometimes based on outlays, they most often use TOA values, and thus require the creation and manipulation of TOA indices. In addition, separate indices are prepared for military pay, civilian pay, and fuel prices which are combined with the purchases indices (on a weighted basis) for each appropriation to produce an overall appropriation TOA index. These individual appropriation indices can be combined (again on a weighted basis) to form an aggregate TOA index (e.g., total operations and maintenance or total Department of Defense).

(2) The following, extracted from a Department of Defense press release on the FY 1997 Defense budget, provides an example of the use of an aggregate TOA index.

(In Billions of Dollars)						
	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001
TOA in Current Dollars	240.5	274.1	322.4	357.2	389.1	425.2
TOA in Constant FY 1997 Dollars	249.3	274.1	304.6	321.1	333.2	346.6
Aggregate TOA Index (Base Year FY 1997)	.965	1.000	1.058	1.112	1.168	1.227

In these kinds of presentations, the budget year is usually chosen as the base year so that estimates of other years can be compared to the budget estimates before the Congress. Any new estimate in current dollars for any of the years can be converted to constant dollars (and vice versa) using the aggregate TOA index as long as it is assumed no change occurs in the inflation index, the relative mix of appropriations, and the outlay rates of those appropriations. It should also be noted that since the terms "constant dollars" and "current dollars" are used with TOA, they are the same as constant or current budgeted dollars.

b. Use of Constant Dollar Estimates.

(1) Constant dollar analyses are used as a tool in setting DOD and DON topline estimates, in presenting or justifying levels of funding requested or required, in assessing budget trends over a period of time, or in comparing budget levels with other budgets (such as those of the Federal Government, other Military Departments, and foreign countries) and aggregate economic measures (such as the GNP).

(2) Estimates of the amount of inflation included in the budget or in cost estimates are often developed for programs using standard appropriation outlay rates. For example, guidance for developing inflation estimates used in the Selected Acquisition Reports (SAR), Unit Cost Reports, and Procurement Annex, requires that standard outlay rates be used. This guidance is issued because of the need to present information consistently at the Departmental level and because of the difficulty in aggregating estimates of inflation for programs which are phased using specific information. The price estimate used in budgeting, however, should always use a specific phasing (not the appropriation outlay rate) whenever it is known.

(3) When a revised inflation estimate is issued by OMB, DOD(C) usually provides the dollar impact of the change by appropriation which is computed by using standard appropriation outlay rates. The dollar impact on individual programs is usually estimated by FMB also using standard outlay rates. These adjustments are made with standard outlay rates only because of the lack of time to accomplish a complete repricing using specific phasing. The dollar estimates obtained should be viewed as an approximation of the impact until such time as a specific repricing of each program can be accomplished. Over or under pricing of the estimates as a result of these approximations must be resolved in the next iteration of the budget preparation process or in execution.

c. Real Program Change.

(1) Constant dollars are used to provide a measure of the real program content of the budget relative to the base year. Real program change (RPC) refers to the year to year change in constant dollars. It is usually expressed as a percentage.

(2) Real program change for a given year is computed by dividing the constant dollars for that year by the constant dollars of the previous year and subtracting one. For example, real program for the FY 1998 DOD budget in the above table is:

(304.6/274.1) - 1 = .111 or 11.1%.

d. Example of a Real Program Change Computation.

(1) Analyses using constant dollars and real program comparisons can be done for any program or aggregation of programs included in the budget.

(2) A real program change computation for a Navy flight training program for FY 1996 through FY 1999 is provided as an example. The following budget costs are involved.

(In Millions of Dollars)				
	FY 1996	FY 1997	FY 1998	FY 1999
APN (for Procurement of trainer Aircraft)	100	120	125	150
O&M	35	37	42	47
Total	135	157	167	197

The O&M costs are further subdivided as follows:

(In Millions of Dollars)				
	FY 1996	FY 1997	FY 1998	FY 1999
Civilian Pay	17	18	20	23
Fuel	12	13	15	17
Other Purchases	6	6	7	7

Application of the correct TOA indices for these years yields constant dollars as presented in the following table:

(In Millions of Dollars)				
	FY 1996	FY 1997	FY 1998	FY 1999
APN	107	120	118	134
O&M Pay	17	18	19	20
Fuel	13	13	14	15
Other	6	6	7	6
Total	143	157	158	175

Real program change is then computed for the total program for each fiscal year.

	FY 1996	FY 1997	FY 1998	FY 1999
	-	+9.8%	+.6%	+10.8

6. Conclusion. The adjustment of price estimates to accommodate the impact of inflation is a complex operation which requires that the analyst understand the concept of inflation, the relationship between TOA and outlays, and the mathematics involved in manipulating and applying indices. The methodology to be followed varies for each price estimate depending upon the specific information available for that estimate. There are no simple "cookbook" rules or procedures that can be followed. In this section, the steps and guidelines for using outlay indices, TOA conversion factors and TOA indices are summarized and some limitations on the use of inflation indices and constant dollar analyses are discussed.

a. Guidelines for the Application of Price Escalation Indices.

(1) After obtaining the latest approved inflation rates from FMB, it is necessary to determine if the base price is stated in constant fiscal year dollars or if it includes inflation beyond the base year. An outlay index must be used to adjust the base price from one year to another (if it is in fiscal year dollars) or to remove the effects of inflation beyond the base year (if it contains estimates of inflation beyond the base year).

(2) Whenever possible, a specific fiscal year phasing of work performed or costs incurred should be used for determining the impact of inflation. Whenever a specific phasing is used, an outlay index must be used to compute the impact of inflation. However, because of the fast spending action of the programs contained in operations and maintenance and military personnel appropriations, specific variances from the appropriation outlay rates have little effect on the adjustment of price estimates for the impact of inflation. Accordingly, programs in those accounts should be phased using the standard appropriation outlay rates, with all adjustments for the impact of inflation accomplished using the TOA indices.

(3) The selection of index and computational method is dependent on the specific pricing and phasing information known for the program being priced. The following paragraphs restate the differences

between outlay indices, TOA conversion factors, and TOA indices. The example of the truck procurement from section 4.h. above is used for illustration purposes.

(a) When costs are stated in fiscal year dollars (outlays), an outlay index is used to convert them to dollars in another fiscal year.

TRUCK EXAMPLE	
Costs are stated in FY 1995 dollars	$25,000
Multiply by FY 1996 index value	1.080
Yields costs in FY 1996 dollars	$27,000
Increase measures amount of inflation that is expected to occur during FY 1996	$2,000

(b) When costs are stated in fiscal year dollars (outlays), a TOA conversion factor is used to adjust them to budgeted dollars in any fiscal year.

TRUCK EXAMPLE	
Costs are stated in FY 1995 dollars	$25,000
Multiply by FY 1996 TOA conversion factor	1.227
Yields price to be included in FY 1996 budget (TOA)	$30,675
Increase measures amount of inflation that is expected to occur from FY 1995 through FY 2000	$5,675

(c) When costs are stated in budgeted dollars (TOA), a TOA index is used to convert them to budgeted dollars (TOA) in another fiscal year.

TRUCK EXAMPLE	
Costs are stated in FY 1995 budgeted dollars	$28,550
Multiply by FY 1996 TOA index value	1.074
Yields price to be included in FY 1996 budget (TOA)	$30,675
Increase measures additional inflation that is expected to occur from FY 1996 to FY 2000 as compared to FY 1995 to FY 1999	$2,125

(4) Examples of computations are provided throughout section 4. A handy “rule of thumb” to remember is that when removing the effects of inflation, the estimate is divided by an index value, and when adding the effects of inflation, the estimate is multiplied by the index volume.

b. Limitations on the Use of Inflation Indices and Constant Dollar Analyses.

(1) The concepts of inflation, constant dollars, and real program change are somewhat limited in that they attempt to simplify a complex situation. At the same time the value and popularity of these concepts stems from this simplicity. They provide a relatively easy way to understand the significance of the total DOD budget, or to measure an increase in areas like operations and maintenance. Because of the danger of oversimplification or misuse of these concepts, it is important that those who use them fully understand these limitations.

(2) Many of the limitations are inherent in the use of any index. Inflation rates and outlay rates are average numbers which, while relatively accurate in the aggregate, are almost never accurate in specific applications. The selection of a base year is always arbitrary, and comparisons to a base year are only valid to the extent that the mix of programs in the years being compared is similar to the mix in the base year. Finally, the approved inflation rate is itself only a forecast, subject to wide variations of accuracy, especially in the more distant future.

(3) The concept of real program change is limited in that it separates all dollars into only two categories - inflationary and real program changes. It does not measure changes in efficient or effective use of funds. A price increase due to inefficiency is treated as a “real” program increase while, conversely, a price decrease due to an improvement in productivity is treated as a “real” program decrease. In both cases, of course, the “real” program does not change. This concept is only one way of measuring real program changes. Other measures, such as the number of ships or aircraft being procured or operated are often a more appropriate measure of real program.

(4) Any application of inflation estimates, whether for pricing or constant dollar analyses of real program levels, implicitly contains many assumptions, many of which are probably not valid in the case of the specific application. The user of this information must be aware of these assumptions and treat the information accordingly.

END OF APPENDIX I